

SECTION 43 3113.37

HIGH EFFICIENCY GAS PURIFICATION FILTERS

LANL MASTER SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the ESM Mechanical POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Information within "stars" is provided as guidance to the author responsible for revising the specification. Delete information within "stars" during editing.

This specification serves as a template. The specification was prepared by an organization operating under a quality assurance program that meets the requirements of 10 CFR 830 (suitable for ML-1 through ML-4 projects). Implementation of this specification requires modification to the specification to meet project-specific requirements. Responsibility for application of this specification to meet project-specific requirements lies with the organization modifying or implementing the specification. The organization modifying the specification shall apply a graded approach to quality assurance based on the management level designation of the project. When this specification is used with nuclear facilities subject to 10 CFR 830, modification to this specification must be performed by an individual or organization operating under a quality assurance program that meets the requirements of that CFR.

This specification serves as a template for procurement of filters at LANL. There is a list of filters that are pre-approved for use in LANL. The performance and design requirements for these filters can be found and referenced in Part 4 (attachments). If none of the pre-approved filters meet the performance or design requirements for a particular application, use this specification in its template format to procure a different filter.

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. High efficiency particulate filter used on gas piping systems.

B. Applicability

1. This specification applies to filters for use in gas streams. When selecting filters ensure that the maximum temperature and pressure ratings of the filter and associated housing are within the particular system requirements.
2. This specification applies to the procurement of filters for Department of Energy (DOE) facilities at Los Alamos National Laboratory.

1.2 REFERENCES

- A. Follow Section 01 4219 Reference Standards
- B. American Society of Mechanical Engineers (ASME).
 - 1. ASME Boiler and Pressure Vessel Code.
 - 2. ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities.
- C. ASTM International (ASTM; formerly American Society for Testing and Materials)
 - 1. ASTM A479, Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels, and for general application.
 - 2. ASTM B16, Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.
 - 3. ASTM E499, Standard Test Methods for Leaks Using the Mass Spectrometer Leak Detector in Detector Probe Mode.
- D. International Organization for Standardization
 - 1. ISO 9001, Quality Management Systems Requirements.
- E. Code of Federal Register
 - 1. 10 CFR 830.122, Quality Assurance.
 - 2. 40 CFR 261, Identification and Listing of Hazardous Waste.

1.3 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

- A. Acceptance Test: Inspection and testing of a filter to verify certain characteristics or properties, which determine the acceptance or rejection of that filter.
- B. Approved Test Aerosol: Particle-generating materials approved by DOE and used as test aerosols for performing testing of HEPA filters.
- C. CMTR: Certified Material Test Report
- D. CoC: Certificate of Conformance
- E. EPA: Environmental Protection Agency
- F. High Efficiency Particulate Air (HEPA) Filter: A filter with a particle removal efficiency of at least 99.97 percent for 0.3 micrometer particles of an approved aerosol test.
- G. IEST: Institute of Environmental Sciences and Technology
- H. Nominal Air Flow Rating: The flow rate which filters are identified by the manufacturer.
- I. NPT: National Pipe Thread
- J. Nuclear Facility: A DOE facility in which radioactive materials are produced or handled to the degree that environmental protection is required.
- K. Penetration: The downstream test aerosol concentration, expressed as a percentage of the upstream test aerosol concentration.
- L. PTFE: Polytetrafluoroethylene

- M. QA: Quality Assurance
- N. SST: Stainless steel
- O. VCR: Crawford Fitting Company's trade name for Cajon metal gasket face seal fitting.

1.4 SYSTEM DESCRIPTION

A. Design Requirements

Edit Design Requirements as necessary and add any additional criteria. Be sure to specify the following:

- Filtration level
- Housing operating pressure
- Pressure differential at specified flow rate
- Operating temperature range
- Housing leak tightness
- End fittings
- Overall dimensions

Part 4 is an appendix of filters commonly used at LANL and their specific specifications. If using a filter from the appendices, transfer data from appendix to the correct section or refer user to appendix for design requirements.

1. [specify filtration level] micron filtration.
2. Housing to withstand a minimum pressure differential of [] in. of water or [] PSI.
3. Pressure differential of less than [] in. of water or [] PSI at a flow rate of [] scfm.
4. Operating temperature range of [] to [] degrees F.
5. [specify leak tightness of housing].
6. [specify end connections].
7. [specify overall dimensions].

1.5 SUBMITTALS

Submittal of QA plan is not necessary if filter manufacturer is on the current LANL IESL (See QA-IQM web site) approved vendor list.

Consider requiring CMTRs for custom fabricated filter housings.

- A. Submit the following in accordance with Section 01 3300, Submittal Procedures:

1. Certificate of Conformance that is signed or otherwise authenticated by responsible managers within the supplying organization and that certifies the conformance of end-items to order requirements. The Certificate of Conformance shall include:
 - a. Copy of the filter manufacturer's QA plan identifying procurement, fabrication, test & inspection, material traceability and non-conformity controls for approval.
 - b. Certification that filters and filter housing have been designed manufactured and constructed in accordance with manufacturer's QA plan and Section 1.6.
 - c. Certification documentation showing that the filter meets the design requirements of Section 1.4, including material requirements of Section 2.3. Examples of such documents include: supplier performance test information, inspection reports, justification for design integrity, drawings, etc.
 - d. Certification that any custom built filter housing was fabricated and leak tested to meet the requirements of this specification. Examples of such document include: personnel certification for welding, inspection and leak testing, leak test procedures and reports.
 - e. Purchased item identified by model number.
 - f. Statement that the filter housing meets the leak test requirements in Section 1.4.
 - g. Purchase Order (PO) number.
 - h. Any approved changes, waivers, or deviations from this specification.
2. Installation Instructions.
3. Warranty documentation - guarantee against failure in proper use or operation caused by defective materials and/or workmanship for a period of 1 year from the date of acceptance.

1.6 QUALITY ASSURANCE AND TESTING

A. Seller's Quality Assurance Requirements

1. Develop, implement, and maintain an approved QA system (including program/plan, procedures, and process control documents) in accordance with 10 CFR 830.122. If the seller's QA plan is not in accordance with 10 CFR 830.122, a LANL approved QA plan based on appropriate industry consensus standards, such as ISO 9001 is acceptable.

1.7 PACKAGING AND SHIPPING

A. Package and ship filters per the requirements for level C items in accordance with ASME NQA-1 and:

1. Ship filters properly orientated, in accordance with manufacturer's recommendation.

PART 2 PRODUCTS

Consider filter environment when selecting acceptable materials. Example: PTFE may not be an acceptable material for a radiation environment. Also note, the listing of materials for filters is not a complete list of possible materials, others may be acceptable. Again, carefully consider the environment (corrosion, radiation, etc) in which the filter will be operating.

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Alternate products may be accepted; follow Section 01 2500, Substitution Procedures.

2.2 MANUFACTURERS

- A. The following is a list of some of the manufacturers with filters that may meet the requirements of this specification. However, these manufacturers are not exempt from any seller requirements including the submission of qualification certification for approval.
 - 1. Mott Corporation
 - 2. Nuclear Filter Technology
 - 3. Pall Corporation
 - 4. PTI Technologies Inc.
 - 5. Swagelok

2.3 MATERIALS OF CONSTRUCTION

- A. General
 - 1. The following are not acceptable materials of construction:
 - a. Asbestos
 - b. Cadmium-coated metals
 - c. Any material that generates EPA regulated wastes as specified in 40 CFR 261.
- B. Filter Media
 - 1. Sintered metal, such as stainless steel, nickel and hasteloy.
 - 2. Ceramic
 - 3. PTFE

C. Housing

1. Type 300 series stainless steel, conforming to ASTM A479.
2. Brass, conforming to ASTM B16.

D. End Fittings

1. End fittings shall be threaded or flanged.
2. Weld or solder fittings are not acceptable.

E. Gaskets and Seals

1. Neoprene
2. Metallic
3. PTFE
4. Viton
5. Buna N

2.4 FABRICATION

Add additional fabrication requirements as necessary, such as welding. Be sure to specify leak tightness and end connections for Filters.

Part 4 is an appendix of filters commonly used at LANL and their specific specifications. If using a filter from the appendices, transfer data from appendix to the correct section or refer user to appendix for additional fabrication requirements.

A. General

1. Filters and housing
 - a. Fabricate in accordance with manufacturer's approved QA plan.
 - b. Assemble Filter from materials designated in Section 2.3.
 - c. Ensure that filter is free from foreign matter and damage.
 - d. Fabricate housing to [specify leak tightness].
 - e. Provide [specify end connections].

2.5 SOURCE QUALITY CONTROL

A. Qualification and Acceptance Test Criteria

1. Perform factory design performance testing in the following categories:
 - a. Penetration – Test with DOE- approved aerosol and test method or the particle counter scanning method as described in IEST-RP-CC001.3. If penetration of specified particle size exceeds [specify penetration], filter is not acceptable.
 - b. Leak Testing – Perform helium leak test in accordance with ASTM E499 or perform bubble leak testing in accordance with ASME Boiler and Pressure Vessel Code, Section V, Article 10.
2. Perform factory product acceptance testing in the following categories:
 - a. Penetration – Test with DOE-approved aerosol and test method or the particle counter scanning method as described in IEST-RP-CC001.3. If penetration of specified particle size exceeds [specify penetration], filter is not acceptable.
 - b. Resistance to airflow – The clean filter resistance to flow shall meet the requirements of Section 1.4 A3.
 - c. Leak testing – Perform helium leak test in accordance with ASTM E499, or perform bubble leak testing in accordance with ASME Boiler and Pressure Vessel Code, Section V, Article 10.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect all filters upon shipment receipt and before installation for visual damage and compliance with specifications. Verify documentation from Section 1.5 is included and is complete, and met specification requirements.

3.2 STORAGE

- A. Store filters per the requirements for level C items in accordance with ASME NQA-1 or in accordance with the manufacturer's requirements, which ever is more restrictive.

3.3 INSTALLATION

- A. Install per manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

- A. Notify Seller, ASM, and QA-IQM of filter rejections and re-evaluate the future procurement status of that manufacturer and/or model.

PART 4 ATTACHMENTS

- 4.1 HEPA Filter – Nuclear Filter Technology High Efficiency, In-Line Filter Assembly
- 4.2 Filter – Swagelok, F Series, In-Line
- 4.3 Filter – Swagelok, TF Series, Tee type

END OF SECTION

Do not delete the following reference information:

FOR LANL USE ONLY

This project specification is based on LANL Master Specification 43 3113.37 Rev. 0, dated January 23, 2006.

ATTACHMENT 4.1

HEPA Filter – Nuclear Filter Technology, High Efficiency In-Line Filter Assembly

A. Design Requirements (Section 1.4)

1. Particle removal efficiency of 99.97 percent of 0.3 micrometers or better of an approved test aerosol.
2. Pressure differential of less than 1.45 in. of water at 0.71 SCFM
3. Helium leak tight ($<1\text{E-}06$ cc/sec) housing
4. 1/4 in. [NPT or VCR] fittings
5. Housing dimensions: 4 in. x 0.85 in. x 6.4 in., with fitting

B. Materials (Section 2.3 B-E)

1. Filter media – 316 SST, sintered metal
2. Housing – 304 SST
3. Gasket – N/A

C. Fabrication (Section 2.4)

1. No additional requirements

ATTACHMENT 4.2

Filter – Swagelok, F Series, In-Line

Pressure resistance and flow rate vary based on operating conditions. Consult manufacturer's specifications.

A. Design Requirements (Section 1.4)

1. 0.5 micron filtration
2. Pressure differential of less than [] psi at [] scfm
3. Housing is not leak tight
4. Fitting size and end connection options
 - a. 1/8 in. Swagelok tube fitting
 - b. 1/4 in. Swagelok tube fitting
 - c. 3/8 in. Swagelok tube fitting
 - d. 1/2 in. Swagelok tube fitting
 - e. 3 mm Swagelok tube fitting
 - f. 6 mm Swagelok tube fitting
 - g. [See manufacture's specification for more options]
5. Housing dimensions: 9/16 - 1 in. dia. x 2.16 - 3.49 in. with fitting (varies by fittings)

B. Materials (Section 2.3 B-E)

1. Filter media – 316 SST, sintered metal
2. Housing – 316 SST or brass
3. Gasket – silver plated 316 SST or aluminum

C. Fabrication (Section 2.4)

1. No additional requirements

ATTACHMENT 4.3

Filter – Swagelok, TF Series, Tee type

Pressure resistance and flow rate vary based on operating conditions. Consult manufacturer's specifications.

A. Design Requirements (Section 1.4)

1. 0.5 micron filtration
2. Pressure differential of less than [] psi at [] scfm
3. Housing is not leak tight
4. Fitting size and end connections options
 - a. 1/8 in. Swagelok tube fitting
 - b. 1/4 in. Swagelok tube fitting
 - c. 3/8 in. Swagelok tube fitting
 - d. 1/2 in. Swagelok tube fitting
 - e. 6 mm Swagelok tube fitting
 - f. 8 mm Swagelok tube fitting
 - g. [See manufacturer's specification for more options]
5. Housing dimensions: 9/16 - 1 in. dia. x 1.87 – 2.20 in. x 2.13 - 3.04 in. with fitting
(varies by fittings)

B. Materials (Section 2.3 B-E)

1. Filter media – 316 SST, sintered metal
2. Housing – 316 SST or brass
3. Gasket – silver plated 316 SST or aluminum

C. Fabrication (Section 2.4)

1. No additional requirements